CLAIMS

1. A process for the polymerization of at least one aliphatic C_{2-20} or aromatic C_{4-20} hydrocarbyl mono- or multiolefin in the presence of a catalyst and an aluminum comprising co-catalyst, characterized in that the catalyst comprises a composition of a metal-organic reagent, a spectator ligand and optionally at least one equivalent of a hydrocarbylating agent.
2. A process according to claim 1, wherein the metal-organic reagent is represented by ML_jX_p, wherein M is a metal from group 3-11, or the lanthanide series, X a monoanionic ligand bonded to M, L a neutral ligand bonded to M, j representing an integer denoting the number of neutral ligands L and p is the valence of the metal M.
3. Process according to claim 1 or 2, wherein the hydrocarbylating agent comprises a metal or a metalloid chosen from group 1, 2, 11, 12, 13 or 14
4. A process according to claim 3, wherein the hydrocarbylating agent comprises Li, Mg, Zn, or Al.
5. Process according to claim 4, wherein the hydrocarbylating agent .is a C_1.C_{20} trihydrocarbyl aluminum or aluminoxane.
6. Process according to claim 1-5, carried out in the presence of a base other than the hydrocarbylating agent.
7. A process according to claim 1-6, wherein the spectator ligand is an imine ligand, or the HA adduct thereof, wherein HA represents an acid, of which H represents its proton and A its conjugate base.
8. A process according to claim 2-7, wherein the metal-organic reagent comprises a group 4 metal and a cyclopentadienyl comprising ligand.
9. A process according to claim 1 - 8, in the presence of between 5 to 10 equivalents of a spectator ligand, preferably an imine ligand.
10. A process according to claim 1-5, wherein the spectator ligand is represented by $(HA_1)_q$ –Z_n- $(A_2H)_r$,wherein A_1 and A_2 are monoacidic cyclopentadienyl comprising ligands, with q and r representing an integer denoting the number of Cp ligands with q+r = 1 or 2, optionally linked by n parallel bridging groups Z, A_1, A_2 separately, or bonded via Z together forming a bidentate diacidic spectator ligand.
11. A process according to claim 1-5, wherein the ligand is a ligand according to the formula HA_1-Z-D$(H)_b$, in which A_1 is a delocalized η^5 bonding cyclopentadienyl comprising ligand, Z is a moiety comprising boron, or a

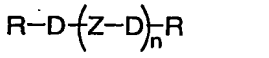
member of Group 14, and optionally also sulfur or oxygen, said moiety having up to 20 non-hydrogen atoms, and optionally A_1 and Z together form a fused ring system, D is a Lewis basic ligand bonded to Z and M, comprising a group 15 or 16 atom and having up to 20 non-hydrogen atoms, optionally D and Z together form a fused ring system and b= 0 or 1.

12. A process according to claim 10 or 11, wherein the metal is a group 4 or group 5 metal, or a metal selected from the lanthanide series.

13. A process according to claim 1-6, wherein the ligand, represented by $(Ar\text{-}R\text{-})_sY(\text{-}R\text{-}DR'_n)_q$, with, Y representing an anionic moiety of S bonded to M of the metal-organic compound, R an optional bridging group between the Y moiety and the DR'_n and/or Ar group, D a hetero atom chosen from group 15 or 16, R' an optional substituent, Ar an electron-donating aryl group, n the number of R' groups bonded to D, q and s integers with $q + s \geq 1$.

14. A process according to claim 13, wherein the metal is a group 4 metal with a valency of 3.

15. A process according to claim 1-5, wherein the ligand is represented by



wherein Z is a bridging group, between two donor atom containing groups (D), D a group comprising a hetero atom chosen from group 15 or 16, and R is a substituent.

16. A process according to claim 15, wherein the metal is a metal from Group 7 – 11.

17. Polymer obtainable with the process of claims 1-16.

18. Polymer obtainable with the process of claim 12, wherein Y is an imine group.

19. Polymer obtainable with the process of claim 18, wherein the imine is a ketimide, phosphinimide, guanidine, or iminoimidazoline.

20. Polymer obtainable with the process of claim 13 wherein D is a ketimide, phosphinimide, guanidine, or an iminoimidazoline.